Appl. No.: 10/707,634
Amdt. Dated: 3/12/2006
Reply to Office action of: 01/10/2006

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (currently amended) A ~~P~~printed circuit board ~~with~~ having an insulated metal substrate with an integrated cooling system, ~~of the type~~ comprising: a metal substrate (10)~~,~~; at least one electrically insulating layer (11) adhered to said metal substrate (10); and several electro-conducting tracks (12) capable of interconnecting electronic power components (24)~~, or a metal layer intended to be transformed into said electro-conducting tracks (12),~~ adhered to said electrically insulating layer (11)~~,~~; ~~characterized in that~~ wherein said metal substrate (10) incorporates ~~several~~ at least one heat transporting ~~channels~~ cavity (13), having at least one opening (14) at one edge (19) of said metal substrate (10), ~~which comprise several conduits~~ said at least one heat transporting cavity (13) having located therein a conduit for a heat-carrying fluid, said conduits ~~which~~ extending by way of said at least one opening (14) to the outside of ~~the~~ ,and upward from, said metal substrate (10) ~~up to~~ forming a sealed heat transfer area ~~to~~ in an external heat transfer medium.

Claim 2 (canceled)

Claim 3 (currently amended) A printed circuit ~~B~~board according to claim ~~2~~ 1, characterized in that said heat-carrying fluid conduits are heat pipes (20) that are closed on both ends and partially full of heat-carrying fluid, with an evaporation region (21) inside of the metal substrate (10) and an external condensation region (22) extending with an inclination a distance outside of the metal substrate (10) and which is in contact with ~~the~~ an external heat transfer medium comprising circulating air.

Claim 4 (currently amended) A printed circuit ~~B~~board according to claim ~~2~~ 1, characterized in that said at least one cavity~~ies~~ (13) ~~are~~ is a through cavity~~ies~~.

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Claim 5 (canceled) A printed circuit ~~B~~board according to claim 1, characterized in that said conduits comprise ~~several~~ a plurality of cavities (13) ~~placed~~ all positioned in a direction that is substantially parallel to said electrically insulating layer (11), at least one of the ends of each one of said plurality of cavities (13) opening into ~~an~~ a plurality of corresponding openings (14) located on at least one edge (19) of the metal substrate (10), ~~whose~~ each of said plurality of openings (14) ~~is~~ being coupled with a span of a pipe (~~20~~ 17) for said heat-carrying fluid, forming a heat transfer area extending upward into said heat transfer ~~area~~ medium.

Claim 6 (currently amended) A printed circuit ~~B~~board according to claim 5, characterized in that each ~~one~~ of ~~the~~ said plurality of cavities (13) has a blind end (16) and ~~has only one~~ an open end having opening (14) on one of ~~the~~ said edges (19) of ~~the~~ said metal substrate (10) in which said span of pipe (17) is coupled at a proximal end, ~~which is provided with~~ said span of pipe (17) further having a blind distal end (18), ~~the~~ said cavity (13) and said span of pipe (17) assembly ~~constituting~~ forming a heat pipe in which ~~the~~ said cavity (13) performs the functions of an evaporation region (21) inside of the substrate (10) and ~~the~~ said span of pipe (17) performs the functions of a condensation region (22) in contact with ~~the~~ an external heat transfer medium comprising circulating air.

Claim 7 (currently amended) A printed circuit ~~B~~board according to claim 6, characterized in that ~~the~~ said openings (14) ~~have~~ further comprise a countersink opening (15) for receiving ~~the~~ said proximal ends of ~~the~~ said respective spans of pipe (17).

Claim 8 (currently amended) A printed circuit ~~B~~board according to claims 1 ~~2~~ or 5, characterized in that said cavities (13) have a circular cross section.

Claim 9 (currently amended) A printed circuit ~~B~~board according to claim s 1 ~~2~~ or 5, characterized in that said cavities (13) have a polygonal cross section.

Appl. No.: 10/707,634
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Claim 10 (currently amended) A printed circuit ~~B~~board according to claim 4, characterized in that said plurality of cavities (13) are parallel to each other and have a longitudinal opening along ~~its entire extension~~ substantially the entire length of each of said plurality of cavities (13) opening onto a side of the metal substrate (10) that is opposite the side thereof on which said electrically insulating layer (11) and electro-conducting tracks (12) are fixed, such that the metal substrate (10) has a cross section shape that is suitable for easily being obtained by extrusion.

Claim 11 (currently amended) A printed circuit ~~B~~board according to claim 4 or 6, characterized in that said metal substrate (10) is formed by two layers (10a, 10b) joined together, said cavities (13) being formed by the juxtaposition of two semi-cavities (13a, 13b) formed respectively on each one of the layers (10a, 10b) of metal substrate (10).